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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: INARIDA et al

Serial No.: 10/664,963

Filed: September 22, 2003

For: Railway Car Drive System

Art Unit: 3617

Examiner: R. McCarry, Jr.

APPELLANTS' BRIEF

Mail Stop Appeal Brief-Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450
Sir:

November 28, 2005

This appeal brief is being filed under 37 CFR 41.37 in connection with the appeal of the above-identified application, a Notice of Appeal having been filed September 28, 2005.

REAL PARTY IN INTEREST

The real party in interest is Hitachi, Ltd. of Japan.

RELATED APPEALS AND INTERFERENCES

No other appeals or interferences are known which will directly affect or be directly affected by or have a bearing on the Board's decision in this pending appeal.

STATUS OF CLAIMS

Claims 2-5 have been cancelled, leaving claims 1, 6 and 7 pending in this application. All the pending claims, i.e., claims 1, 6 and 7 stand finally rejected and are on appeal. A copy of the claims 1, 6 and 7 on appeal appear in the Appendix hereto.

STATUS OF AMENDMENTS

An Amendment after Final Rejection was filed August 29, 2005, which only amended the abstract. That amendment has apparently been entered since the Advisory Action mailed September 16, 2005 does not indicate otherwise.

SUMMARY OF THE INVENTION

The present invention relates to a railway car drive system for accelerating and decelerating a train by a driving a motor via a power converter using power generated by a power generation means as its power source.

Independent claim 1 and dependent claims 6 and 7 relate to a railway car drive system wherein each railway car has a particular construction, as illustrated in Fig. 1 of the drawings of this application, and described in the specification of this application, for example. As shown in Fig. 1, and as recited in independent claim 1, a first railway car 1 mounts a power generator 10, as a power generation means, and a power converter 20 for controlling a driving motor (not shown) for driving plural driving wheels 30. A plurality of second railway cars 2, 2, 2 are provided, and the second railway car also mounts a power converter 20, which controls a driving motor (not shown), for driving plural driving wheels 30. A power storage means 50 is

mounted on either a first railway car 1 or the second railway car 2, or both of the railway cars with Fig. 1 illustrating a power storage means 50 provided on each of the first railway car 1 and each of the plurality of railway cars 2, as described at page 6, line 21 to page 7, line 11 of the specification. As described therein, and as illustrated in Fig. 1, a power transmission means connects the power generation means 10 of the railway car 1 with each power converter 20 of a respective railway car so that the power converters and driving motors are operated using the power generator 10 of the railway car 1 as a power source. Further, as described at page 12, lines 21 - 24, although not illustrated in the drawings, a third railway car mounting only a power storage means 50 (that is, without a power generation means, an electric motor or a power converter) is provided, which serves to increase the capacity of the power storage means of the railway car drive system.

In operation, as described at page 7, line 20 to page 8, line 9, of the specification, and as illustrated in Fig. 3(A), while the train is stopped, the generated power of the power generator 10 is stored in each of the power storage means 50, so that a portion of the power necessary for acceleration is stored in each of the power storage means 50. The train, which is formed of the first railway car 1, second railway cars 2, and a third railway car (not shown), is accelerated by driving a driving motor by the power from the power generator 10 and the plural storage means 50. In order to equalize (level) the power generated by the power generator 10, for example, the ratio between the output power from each of the power storage means 50 and the output power of the power generation means 10 is adjusted as shown in Fig. 3(A). During deceleration, as described at page 8, line 17 to page 9, line 2 of the specification, the power converter 20 is controlled to operate the driving motor as

a power generator and to store the generated power to the power storage means 50, thereby obtaining regenerative braking power. By utilizing the regenerative power stored in the power storage means 50 during regenerative braking as powering force for acceleration, the energy efficiency is improved greatly. Thus, the power storage means stores both the power generated by the power generation means and a regenerative power obtained during braking of the train or stores either the power generated by the power generation means or the regenerative power, and drives the driving motor via the power converter using as a power source either both the power generator and the power storage means or only the power storage means so as to drive the train.

In accordance with the present invention a power management means 100, as illustrated in Fig. 1, is provide for managing the generated power of the power generation means 10 disposed on the first car 1 and the stored power of the power storage means 50 which is disposed on each of the railway cars, as described at page 7, lines 8-11, of the specification. As described in connection with Fig. 3(B) at page 9, lines 3-18, of the specification, the power management means serves for controlling the power generated by the power generation means and the storage quantity of the power storage means so as to minimize the power capacity of the power generation means. That is, in the example of the Fig. 3(A), as described at page 8, lines 6-9 of the specification, the ratio between the output power from each of the power storage means 50 and the output power of the power generation means 10 is adjusted so that a portion of the driving power is borne by each power storage means 50, so that the maximum value of the power generated by the power generation means 10 can be reduced to approximately one-half. Furthermore, by

controlling the power generated by the power generation means in the storage quantity of the power storage means, the weight and size of the equipment of the train may be cut down, and the power management means 100 serves for constantly monitoring the amount of power stored in the power storage means 50 and for controlling and adjusting the amount of power stored therein according to the operational status of the train as described in connection with Fig. 3(B) at page 9, line 24 to page 11, line 24 of the specification.

More particularly, the power management means 100 takes into consideration the amount of power borne by the power storage means 50 during acceleration which is denoted as a power load quantity X of the power storage means, and the amount of power borne by the power generation means 10 which is denoted as power load quantity Y of the power generation means. Furthermore, the power management means 100 takes into consideration the regenerative energy quantity (regenerative power quantity) Z obtained by the regenerative breaking from the start of deceleration to the stopping of the train by the power storage means 50, the power (remaining capacity) R remaining in the power storage means 50 at the start of deceleration so as to control the same in accordance with the equation (1) at page 10, lines 15 and 16 of the specification, wherein:

Remaining Capacity R < Storage capacity C of power storage
means - Regenerative energy quantity Z;

thereby enabling the regenerative breaking from the start of deceleration to the stopping of the train to be utilized fully, enabling the regenerative energy to be utilized effectively and the regenerative breaking to be applied safely.

As described at page 11, lines 18-24, of the specification, plural power

management means 100 are provided to correspond to the power generation means 10, the power storage means 50 and the power converter 20, respectively with the plurality of power management means 100 mutually exchanging information regarding the power status of each means in performing power control of the respective means. As described at page 12, lines 21-24 of the specification, the power management means 100 is disposed to each of the cars, to thereby control the power generation means, the power converter and the power storage means independently, and thereby achieving necessary power while reducing the size and weight of the power generation means and advantageously obtaining reliability of the railway cars.

Claim 6 recites the feature that the power storage means is a chargeable-dischargeable battery as described at page 11, line 25 of the specification, whereas claim 7 recites the feature that the power storage means is a capacitor or a fly wheel as described at page 11, line 26 of the specification.

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Claims 1, 6 and 7 stand rejected under 35 USC 103(a) as being unpatentable over Kumar (US 6,591,758).

ARGUMENT

In applying Kumar to the claimed invention, the Examiner in the final rejection dated April 28, 2005, indicates that Kumar discloses a railway car drive system comprised of a first railway car, as shown in Fig. 3, having a power generation means 102, a power converter 106 and a plurality of driving motors 108, a second

railway car, also shown in Fig. 3, having a power converter 306 and a plurality of driving motors 308, and also a second power generation means 302. As indicated by the Examiner, the driving motors use power from the generation means 102, 302 of each car to operate the respective driving motors. The Examiner further indicates that a power storage means is also incorporated into the system with the figures showing the energy storage means to be mounted on a separate third railway car and that the disclosure states in column 6, lines 32 - 49 that the energy storage means can be fitted onto the same car with the other aforementioned components. Kumar at columns 7 and 8 describe the first railway car as a locomotive or engine vehicle, the second railway car as a second engine vehicle (locomotive) and the third railway car as an energy tender vehicle.

Irrespective of the contentions by the Examiner, it is noted that in Figure 3 of Kumar, the first railway car having the power generation means or engine 102 is provided with grids 110 and the second railway car having a second power generation means or engine 302 is provided with a grid 310. As described with respect to the prior art of Fig. 1A and 1B of Kumar, in column 2, lines 15 - 20, the energy generated in the dynamic breaking mode is typically transferred to resistance grids 110 mounted on the locomotive housing and the dynamic breaking energy is converted to heat and dissipated from the system. In other words, electric energy generated in the dynamic breaking mode is typically wasted. However, in accordance with Figure 3 of Kumar, as described in column 9, lines 6 - 20, when traction motors 108 are operated in a dynamic breaking mode, at least a power of the generated electrical power is routed to an energy storage medium such as energy storage 204 and to the extent that the energy storage 204 is unable to

receive and/or store all of the dynamic breaking energy, the excess energy is preferably routed to breaking grids 110 for dissipation as heat energy. Also, during periods when engine 102 is being operated such that it provides more energy than needed to drive traction motors 108, the excess capacity may be optionally stored in energy storage 204. Based upon this disclosure of Kumar, appellants submit that Kumar does not disclose or teach in the sense of 35 USC 103 "a second railway car mounting a power converter and a driving motor using said power generation means as a power source", (emphasis added), it being noted that the power generation means of claim 1 is mounted on the first railway car and utilized as the power source by the second railway car. That is, in Figure 3 of Kumar, a power generation means or engine 102 of the first railway car supplies power to power converter 104, 106 and driving motors 108 of the car thereof. Similarly, the second railway car has a power generation means or engine 302 which supplies power by way of power converter 304, 306 to the traction motors 308 thereof. However, irrespective of the contentions by the Examiner, the power generation means 102 of the first railway car does not serve as the power generation means of the second railway car for driving the power converter 304, 306 and the traction motors 308 thereof. Thus, Kumar fails to disclose or teach the aforementioned recited feature of claim 1.

Furthermore, claim 1 recites the feature of a power management means being disposed in every car so as to control each said power generation means and said power storage means independently. In this regard, claim 1 recites the feature that the first railway car mounts the power generation means, and that the second railway car utilizes the power generation means (of the first railway car) as a power source thereof, that either one or both of the first and second railway cars have a power

storage means operating in a particular manner, and that a third railway car mounts a power storage means. As pointed out above, such features are not disclosed or taught by Kumar. That is, while Kumar, based upon the Examiner's contention, may be considered to provide a third railway car as illustrated in Fig. 3, which mounts a power storage means 204, and assuming, arguendo, that the other two railway cars may also mount a power storage means therein, it is readily apparent that the second railway car of Kumar does not utilize the power generation means of the first railway car as a power source thereof.

Furthermore, claim 1 recites the feature of a power management means being disposed in every car so as to control each said power generation means and said power storage means independently. With respect to the power management means, the Examiner contends that the system of Kumar is further comprised of a power management system 502 for controlling use of energy for driving the railway car and a processor 506 associated with the system uses present or upcoming track conditions to determine power storage and power transfer requirements as well as possible energy storage opportunities with the system being described in column 10, lines 40 - 65 and Figure 5 being a block diagram showing energy generation and storage.

The Examiner recognizes that "Kumar does not distinctly state that an energy management processor is installed on each car. It would have been an obvious multiplication of parts to one of ordinary skill in the art to have installed a processor to each power car so that each car can be monitored separately and therefor not to overload a single processor. Also, the additional processors would allow for more efficient control of the power on each car as opposed to a single processor and

would allow for the additional processors to back up a single processor in the event of a malfunction." (emphasis added) Appellants submit that the Examiner has engaged in a hindsight reconstruction of Kumar based upon appellants' disclosure, which is not proper. Reference is made to the decision of In re Lee, 61 USPQ 2d 1430 (Fed. Cir. 2002).

Irrespective of the contentions by the Examiner, Figure 5 of Kumar discloses a single energy management system 502 for possibly enabling control of the engine 102, the energy capture and storage 204 and various structures with respect to all of the railway cars. That is, as described at column 9, lines 56 - 62, Fig. 5, in addition to disclosing that the energy management system 502 is responsive to the engine 102 and the energy capture and storage 204, such system is also responsive to an additional energy source 504. That is, column 9, lines 56 - 62 indicates that Fig. 5 also illustrates an optional energy source 504 that is preferably controlled by the energy management system 502 and the optional energy source 504 may be a second engine (e.g., the charging engine illustrated in Fig. 3 or another locomotive in consist) or a completely separate power source (e.g., a power source such as battery charger) for charging energy storage 204. Thus, the single energy management system 502 may be considered to control the energy source 504 in the form of the engine 302 of Fig. 3 of Kumar or an external charging source 220 as shown in Figure 2 of Kumar. In any event, it is apparent that Kumar does not provide any disclosure or teaching of providing an energy management system in each of the first, second and third railway cars of claim 1, as necessarily obtained so as to control each said power generation means and said power storage means independently, as recited in claim 1 and therewith dependent claims 6 and 7.

CONCLUSION

For the foregoing reasons, the final rejections should be reversed.

FEES

The Appeal Brief fee is submitted herewith.

Please charge any shortage in the fees due in connection with the filing of this paper, including extension of time fees, to the deposit account of Antonelli, Terry, Stout & Kraus, Deposit Account No. 01-2135 (Case: 648.43135X00), and please credit any excess fees to said deposit account.

Respectfully submitted,

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APPENDIX

1. A railway car drive system comprising:

a first railway car mounting a power generation means, a power converter and a driving motor; and

a second railway car mounting a power converter and a driving motor using said power generation means as a power source;

wherein a power storage means is mounted on either said first or said second railway car, or both said first and second railway cars, said power storage means storing both the power generated by said power generation means and a regenerative power obtained during braking of said train, or storing either the power generated by said power generation means or the regenerative power, and driving said driving motor via said power converter using a power source either both said power generation means and said power storage means or only said power storage means, to drive a train;

a third railway car mounting power storage means, to thereby increase the capacity of the power storage means of said railway car drive system; and

a power management means for controlling the power generated by said power generation means and the storage quantity of said power storage means so as to minimize the power capacity of said power generation means, said power management means being disposed in every car so as to control each said power generation means and said power storage means independently.

6. The railway car drive system according to claim 1, wherein said power storage means is a chargeable-dischargeable battery.

7. The railway car drive system according to claim 1, wherein said power storage means is a capacitor or a flywheel.